



## Temporal analysis of the interference caused by paratuberculosis vaccination on the tuberculosis diagnostic tests in goats

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### ABSTRACT

Vaccination against paratuberculosis (PTB) in goats is a cost-effective control strategy, and is also effective as regards preventing the onset of clinical cases. However, it causes interference in the diagnostic tests used in the control of tuberculosis (TB). A group of 99 goats from a herd with no history of TB or PTB infection was vaccinated against PTB at seven months of age. They then underwent consecutive intradermal tests [single (SIT) and comparative (CIT) intradermal tuberculin tests], interferon-gamma release assays (IGRA) and two serological tests (p22<sub>CE</sub> and DR-ELISA) every three months, until the interference disappeared. When using the SIT test, a variable number of positive reactors were observed at 3 months (T3; 32.3%, 95% CI 23.9–42.1), 6 months (T6; 11.5%, 95% CI 6.5–19.4), 9 months (T9; 6.4%, 95% CI 3.0–13.2) and 12 months (T12; 0%, 95% CI 0–4.0) post-vaccination. In contrast, the CIT test had a specificity (Sp) of 100% (95% CI 96.0–100), regardless of the time post-vaccination. The IGRA also obtained high Sp values throughout the study period. No significant interference in the serological tests was recorded at T3 [p22<sub>CE</sub>, Sp = 96% (95% CI 90.1–98.4) and DR-ELISA, Sp = 98% (95% CI 92.9–99.4)], although an increase in antibody titers was observed in the following herd testing events. In conclusion, the use of the SIT test causes the onset of false-positive reactors if applied before 12 months post-vaccination in a TB-free/PTB-vaccinated herd. Nevertheless, the CIT test and IGRA obtained high Sp values under these epidemiological circumstances. The serological tests were also highly specific in the case of PTB-vaccinated goats, although their Sp decreased significantly after several intradermal tests.

### 1. Introduction

Tuberculosis (TB) and paratuberculosis (PTB) are relevant mycobacteriosis that are distributed worldwide, and both imply a great impact on the goat-farming industry. They cause productive losses that become more evident in European countries with significant goat populations, such as Spain or Greece (Eurostat, 2017). Since TB is a zoonotic disease and PTB has been associated with Crohn's disease in humans, they may also pose a considerable threat to public health in developing countries in Africa and Asia that have a significant goat population (these continents respectively had 38.7% and 55.4% of the

global production of goats in 2016, according to the FAO), and in which health policies and control measures are limited (FAOSTAT, 2018). PTB, or Johne's disease (JD), which is caused by *M. avium* subsp. *paratuberculosis* (MAP), leads to chronic granulomatous enteritis in goats and results in a loss in the milk yield and a reduced carcass weight. PTB vaccines have consequently been developed as a control measure in order to prevent the clinical disease, and yield better cost-benefit ratios than those attained when applying test and cull strategies in small ruminants (Juste and Casal, 1993; Bastida and Juste, 2011). However, vaccination against PTB with live or inactivated vaccines in cattle and small ruminants is known to cause a confounding effect on

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